

ficiently and effectively contact the molten metal with the traversing gas within one or more stages 13 so as to decompose the aluminum monochloride to aluminum and aluminum trichloride.

The invention has been described with respect to an illustrative embodiment, wherein molten aluminum is sprayed into a free-space traversed by aluminum monohalide gas. It is to be clearly understood that the principles of the invention are equally applicable to any gas-liquid contact situation wherein it is desirable to form a very uniform, small droplet spray throughout the interior of a free-space occupied by, or particularly traversed by, a gas to be contacted by the liquid. As will be apparent to those skilled in the art changes may be made in the precise form and arrangement of the parts without departing from the spirit and scope of the invention. All such modifications are contemplated within the scope of the appended claims.

What is claimed is:

1. In apparatus for mixing and contacting a gas with a liquid, including a chamber having a lower liquid region adapted to contain said liquid and an upper gas region adapted to accommodate said gas over the surface of said liquid, and liquid spraying means for continuously spraying said aluminum liquid throughout the gas region of said chamber; in combination therewith, the improvement in said spraying means for spraying fine droplets relatively uniformly distributed throughout said gas region, comprising:

(a) a vertically disposed shaft extending downward into said aluminum liquid region and upward through said gas region, and mounted for powered rotation about the vertical axis thereof; and

(b) at least one helical passageway secured to the outer surface of said shaft and extending from the lower portion thereof within said aluminum liquid region upwardly along said shaft through said gas region, being totally enclosed except for

(i) an open end of said passageway located within said aluminum liquid region, adapted to admit a stream of aluminum liquid into said passageway when said shaft is rotated so that said open end advances in the aluminum liquid of said liquid region, and

(ii) a plurality of orifices in the lateral wall of said passageway distributed along the helical path thereof throughout said gas region for emission of aluminum liquid in lateral streamlets from said passageway under centrifugal force developed due to the rotation of said passageway with said shaft.

2. An apparatus according to claim 1 further wherein two such helical passageways are secured to said shaft, having the same sense, and having their respective open ends spaced one from the other around the periphery of the lower portion of said shaft.

3. An apparatus according to claim 1, wherein the diameter of each of said orifices and the distribution of the plurality of orifices is such as to provide streamlets of liquid of varied volumetric flow rates at varied elevations within said gas region, so as to fill the entire gas region with fine droplets.

4. An apparatus according to claim 1, wherein said chamber includes gas inlet and outlet means to provide traversal of gas through said gas region, and wherein said spraying means is located adjacent said gas outlet means, and further including a baffle located immediately adjacent to said spraying means to direct the spray emitted therefrom between a direction generally toward said inlet means and a direction generally perpendicular to the direction of traversal of said gas within said chamber.

5. In apparatus for mixing and contacting a relatively hot traversing aluminum monohalide gas with a relatively cool molten aluminum liquid repository so as to cool said gas until decomposition into aluminum metal and alumi-

num trihalide is achieved, including at least one chamber having a lower liquid region adapted to contain said molten aluminum liquid and an upper gas region adapted to accommodate said traversing aluminum monohalide gas over the surface of said liquid, gas inlet means and gas outlet means to provide traversal of said monohalide gas through said gas region, and liquid spraying means for continuously spraying said aluminum liquid throughout the gas region of said chamber; in combination therewith, the improvement in said spraying means for spraying fine droplets relatively uniformly distributed throughout said gas region, comprising:

(a) a vertically disposed shaft extending downward into said aluminum liquid region and upward through said gas region, and mounted for powered rotation about the vertical axis thereof; and

(b) at least one helical passageway secured to the outer surface of said shaft and extending from the lower portion thereof within said aluminum liquid region upwardly along said shaft through said gas region, being totally enclosed except for

(i) an open end of said passageway located within said aluminum liquid region, adapted to admit a stream of aluminum liquid into said passageway when said shaft is rotated so that said open end advances in the aluminum liquid of said liquid region, and

(ii) a plurality of orifices in the lateral wall of said passageway distributed along the helical path thereof throughout said gas region for emission of aluminum liquid in lateral streamlets from said passageway under centrifugal force developed due to the rotation of said passageway with said shaft.

6. A screw-lift for lifting liquid from a lower liquid region into an upper region and spraying the liquid in fine droplets laterally within said gas region, comprising:

(a) a shaft mountable vertically for powered rotation; and  
(b) at least one helical passageway secured to the outer surface of said shaft and extending therealong, being totally enclosed except for

(i) an open end of said passageway;

(ii) a plurality of orifices in the lateral wall of said passageway distributed along the helical path thereof throughout the portion thereof remote from said open end and corresponding to the portion thereof adapted to lie within said gas region for emission of aluminum liquid in lateral streamlets from said passageway under centrifugal force developed due to the rotation of said passageway with said shaft.

7. An apparatus according to claim 6 further wherein two such helical passageways are secured to said shaft, having the same sense, and having their respective open ends spaced one from the other around the periphery of said shaft.

8. An apparatus according to claim 6, wherein the diameter of each of said orifices and the distribution of the plurality of orifices is such as to provide streamlets of liquid of varied volumetric flow rates at varied elevations within said gas region, so as to fill the entire gas region with fine droplets.

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